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QUARTERLY PROGRESS REPORT, OCTOBER 1-DECEMBER 31, 1970

Pacific Northwest Water Laboratory
Corvallis, Oregon

January 1971

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QUARTERLY PROGRESS REPORT

PACIFIC NORTHWEST WATER LABORATORY CORVALLIS, OREGON

OCTOBER 1 — DECEMBER 31, 1970

ENVIRONMENTAL PROTECTION AGENCY

FEDERAL WATER QUALITY ADMINISTRATION

NORTHWEST REGION

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CLEAN WATER

PACIFIC NORTHWEST WATER LABORATORY

QUARTERLY REPORT

October 1 through December 31, 1970

United States Department of the Interior
Federal Water Quality Administration
Northwest Region, Corvallis, Oregon

January 1971

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NATIONAL WASTE TREATMENT RESEARCH PROGRAM

FOOD WASTES RESEARCH - PPB 1206

Status of Activities and Significant Accomplishments

The Second National Symposium on Food Processing Wastes has been scheduled for March 23-26, 1971, in Denver, Colorado.

Kenneth A. Dostal presented a paper titled, "Federal Water Quality Administration Demonstration Grants Program," at the PNPCA Annual Meeting in Victoria, B.C.

Both pilot plants at the United Flav-R-Pac Cannery in Salem, Oregon, were operated successfully until the end of processing in December. Both the RBC unit and the aerated lagoon achieved BOD removals near 90 percent. Effluent SS levels from both units were consistently less than 100 mg/l. In general, the RBC unit with a detention time of four hours appeared to be more sensitive to shock loads than the aerated lagoon with a 10-day or more detention time. The RBC also recovered much faster than the aerated lagoon. A final report on this project is being prepared and the results will be presented at the Symposium in March.

Following termination of processing at the Salem cannery the RBC pilot plant was transferred to the Ore-Ida food processing plant in Ontario, Oregon. It will be operated about four months at this site before returning the unit to the manufacturer. Potato processing waste following primary clarification will serve as the influent to the RBC unit.

Initial arrangements have been made for our personnel to operate and monitor a new, full-scale waste treatment plant at Van Waters & Roger's United Centennial Mills in Spokane, Washington. The plant, a first, consists of three 100,000 gallon anaerobic trickling filters and supporting equipment. The filters will be operated in parallel and will be fed high-strength wastes from the starch plant. Estimated plant flow is 100 gpm with a BOD of about 6,000 mg/l and a COD of about 11,000 mg/l.

Grant and Contract Research

The following grant proposals and preproposals were received during the quarter:

1. Evaluation of both "dry" and "wet" caustic peeling of potatoes using potassium hydroxide.
2. Demonstration and development of whey fermentation.
3. Development of process waste control data in industry.
4. Demonstration of animal feed preparation from seafood processing wastes.
5. Treatment of seaweed processing waste using an anaerobic upflow system.
6. Characterization and treatment of brandy stillage.
7. Evaluation of land irrigation in Northern regions.
8. Treatment of total wastes from wet milling industry.
9. Low water volume enzyme deactivation of vegetables before preserving.

Numerous contract proposals for Industrial Waste Profiles for the dairy, meat and grain milling, as well as canned and preserved fruit and vegetable industries were reviewed and evaluated.

Current status of monitored grants is as follows:

1. 12060 EUZ "Winery Wastewater--Characterization and Treatment" Widmer's Wine Cellars, Naples, New York. Construction is now scheduled for completion about January 15, 1971.

2. 12060 EKQ "Kent Cheese Company--Waste Treatment Facility" Kent Cheese Company, Melrose Park, Illinois. Continued difficulty is being encountered in getting the post-construction studies started. As yet no meaningful data have been obtained.

3. 12060 EHS "Cannery Waste Treatment by Lagoons and Oxidation Ditch" Melbourne Water Science Institute, Melbourne, Victoria, Australia. The first draft of the final report is completed and will be submitted for review shortly.

4. 12060 EHV "Aerobic Secondary Treatment of Potato Processing Wastes with Mechanical Aeration" The R. T. French Co., Shelley, Idaho. The draft of the final report was submitted for review.

5. 12060 DSI "State-of-the-art, Sugarbeet Processing Waste Treatment" Beet Sugar Development Foundation, Fort Collins, Colorado. A second draft of the final report has been reviewed.

6. 12060 ECF "Water Pollution Abatement in the United States Seafood Industry: State-of-the-art" Oregon State University, Corvallis, Oregon. The final report is being reproduced for distribution.

7. 11060 EZR "Complete Aerobic Treatment of Combined Domestic and Industrial Wastes with Mechanical Aeration," City of Dallas, Oregon. Work is continuing on the final report.

8. 12060 EIG "Full-Scale Demonstration and Evaluation of Potato Dry and Wet Caustic Peeling Processes," Western Potato Service, Inc., Grand Forks, North Dakota. Data collection is continuing at both potato processing plants.

9. WP-01486-01 "Status and Research Needs for Potato Waste Waters," University of Washington, Seattle, Washington. Project is still waiting for final audit.

10 12060 FAD "Pollution Prevention by Aeration of Fruit Processing Wastes," Snokist Growers, Yakima, Washington. Questions raised by final audit are yet to be resolved.

11. WPD 93-04-68 "Anaerobic-Aerobic Sugar Beet Waste Treatment" Beet Sugar Development Foundation, Fort Collins, Colorado. Still waiting for final report draft.

12. 12060 DXL "Reduction of Salt Content of Food Processing Liquid Waste Effluent," National Canners Association, Berkeley, California. Data collection is complete. Preparation of final report underway.

13. 12060 EDK "Production and Disposal Practices for Liquid Wastes from Canning and Freezing Fruits and Vegetables," National Canners Association, Berkeley, California. Final report is still being revised.

14. 12060 EHT "Use of Fungi Imperfecti in Waste Control," North Star Research & Development Institute, Minneapolis, Minnesota. Final audit completed but appendix of data has not been submitted.

15. 12060 EDZ "Pilot Plant Installation for Use of Fungi Imperfecti on Vegetable Wastes," Green Giant Company, LaSueur, Minnesota. Work is continuing on final report.

16. 12060 FAK "Concentration of Sugar Beet Wastes for Economic Treatment with Biological Systems," Beet Sugar Development Foundation, Fort Collins, Colorado. Suggested revisions to the final report are being made prior to submittal to Headquarters.

17. 12060 FQE "Dry Caustic Peeling of Tree Fruit to Reduce Liquid Waste Volume and Strength," National Canners Association, Berkeley, California. A rough draft of the final report was received.

18. 11060 FJQ "Pollution Abatement and By-Product Recovery in Shellfish and Fisheries Processing--Phase I," City of Kodiak, Alaska. Data collection on the protein recovery process continues as well as evaluation of waste collection and transportation methods and of potential sites.

19. 12060 FLL "Activated Sludge--Bio-Disc Treatment of Distillery Wastes," American Distilling Company, Pekin, Illinois. Construction is underway with completion scheduled for March 1971.

A grant was awarded to Central Soya, Chicago, Illinois, for "Demonstration of a Process for the Abatement of Pollution from Soy Protein Whey." Ultrafiltration will be used to lower the BOD and, hopefully, result in a by-product stream with economic value.

A grant was also awarded to American Crystal Sugar Company in Denver, Colorado, for a project titled, "Separation, Dewatering and Disposal of

Sugarbeet Transport Water Solids." Various methods of clarification with and without chemicals as well as methods of sludge thickening and final disposal will be evaluated in Phase I prior to design and installation of full-scale facilities.

Plans for Third Quarter, FY 1971

1. Continue grant monitoring
2. Hold Second Food Waste Symposium
3. Complete report on Salem pilot plant operation
4. Monitor Van Waters and Rogers anaerobic trickling filters.
5. Evaluate RBC unit on potato processing wastes.
6. Present papers at the following technical meetings:
   (a) Oregon Dairy Industries Conference
   (b) Second National Symposium on Food Processing Wastes
   (c) Institute of Food Technologists - Symposium on Food Science
   (d Environmental Engineering in the Food Industry (Engineering-Foundation)
   (e) Food Update Seminar

PAPER AND FOREST INDUSTRIES RESEARCH - PPB 1204, 1210, 1301

Status of Activities and Significant Accomplishments

A field project at the Crown Zellerbach Corporation, Lebanon, Oregon plant has been started and now is in the construction phase. This project, for removal of suspended solids from effluents by mechanical means, will be utilizing a 28,000 gallon metal basin for aeration along with the microsieve

screen. Objectives are to determine the feasibility of solids removal before and after biological treatment; such activities should commence about March 1.

During the quarter an investigation of bark leachate characteristics was set up at PNWL. Four lysimeter columns were filled with Douglas-fir, Hemlock, Red alder and Western Red Cedar bark pieces. Natural rainfall has supplied water and this leached waste has been collected and analyzed to calculate waste loadings.

An in-house project for investigating solids, color, and coliform removal using synthetic polymers has continued on pulp and paper mill wastes. Sulfite pulping wastes were treated with several coagulants and polymers with some success, however, these wastes required much higher concentrations of chemicals than Kraft mill wastes for similar solids removals. Several new low cost polymers have been obtained for future studies.

Consulting services were provided on pulp and paper waste treatment during the quarter. Such services included treatment process considerations for the St. Regis Paper Company (Atlanta Office) and Alaska Lumber and Pulp Company (Portland Office).

Mr. Boydston presented a paper titled "Plywood and Sawmill Liquid Waste Disposal" at the Innovation in the Forest Products Industry Meeting of the Forest Products Research Society in Penticton, B.C., October 8.

Grant and Contract Research Studies

Eight new grant proposals including three on wood preservative wastes, and two preproposals were received.

Final report drafts were received from three projects. Crown Zellerbach's aerated lagoon treatment report has been reviewed and returned for final preparation. Mead Corporation's pilot plant work has been reviewed and also returned for final draft preparation. A report on fiber modification from the University of Washington has been submitted and returned again for additions. The final draft of OSU's photographic tracing techniques has been received.

Personnel Actions

Phil Roush, Sanitary Engineer, joined the PFI staff after the completion of his Master's degree at the University of Cincinnati, Ohio. He is studying the wastes from wood preserving plants and artificial forest fertilization.

Plans for Third Quarter, FY 1971

1. The characterization of bark fill leachates will continue for the four wood types now being investigated. Laboratory bark extraction studies may be started in addition.

2. Work on coagulation of pulp and paper industry wastes effluents will be continued for solids, coliform, and color removal.

3. Construction of piping and equipment erection should be completed on the Lebanon, Oregon field project for solids separation.

4. Grant application and report reviews and monitoring will continue.

5. Consulting services will be increased.

NATIONAL THERMAL POLLUTION RESEARCH PROGRAM

PPB 1613

Status of Projects and Significant Accomplishments

Work Plan ZFL: Consultation and Advisory Services

As a follow-up to the presentation of the report, "Feasibility of Alternative Means of Cooling for Thermal Power Plants Near Lake Michigan" at the September 1970 Workshop Session of the Lake Michigan Enforcement Conference, back-up data and supplementary material were transmitted to several consulting engineering firms and electric utility companies.

Dr. Tichenor represented the Environmental Protection Agency at a two-day OECD meeting on thermal pollution held in Paris, France. Technical experts from Switzerland, Italy, Sweden, Netherlands, Spain and the United States were brought together to recommend areas of study for a proposed OECD committee on thermal pollution. Subsequent to the meeting, pertinent technical literature was transmitted to those attending the meeting.

Dr. Garton visited the Southwest Regional Office to discuss thermal pollution problems in the Southwest. He then traveled to La Jolla where he was guest speaker at a colloquy of Gulf General Atomic Corporation on the subject of "Biological Effects of Thermal Pollution." This meeting was attended by about 150 persons from Gulf General Atomic, Scripps, Ocean Engineering Information Service and several State agencies.

Mr. Dowty of Gulf General Atomic Corporation visited NTPRP to describe the work and interests of the company in nuclear power production and pollution abatement.

NTPRP staff members lectured at the Training and Manpower short course, "Analysis and Control of Thermal Pollution," held December 7-11 at the Pacific Northwest Water Laboratory.

Mr. Rainwater traveled to Dallas where he met with staff members of the South Central Regional Office to discuss salt water cooling in connection with the Houston Power and Light permit and to the Ohio Basin Region at the request of the Regional Director to assist in a meeting concerning issuance of a permit to Duquesne Power Company. Additional information was provided on the implications of engineering alternatives to the present plan proposed by the power company for handling condenser cooling water.

Plans for Next Quarter

1. At the request of the Southwest Region, Dr. Tichenor and Mr. Christianson will participate in a Thermal Pollution Seminar for the Bureau of Reclamation in Denver on February 2-3, 1971.

2. At the request of the Mid-Atlantic Region, Dr. Tichenor will attend a meeting in Charlotte, North Carolina on February 8 to evaluate a proposed cooling water discharge from a nuclear power plant to be constructed by Duke Power Company.

3. At the request of the Department of Environmental Quality of the State of Oregon, analyses will be conducted to determine possible environmental effects from the cooling tower plume of the proposed Trojan nuclear power plant.

Work Plan ZFC: Heat Transport and Behavior in the Mixing Zone

1. Reportable Progress

   a. Insect emergence study -- (None)

   b. Outfall design -- (None)

2. Continuing Projects

   a. In-house

      "Turbulent Diffusion of a Heated Plume" (cooperative study with USGS and plans for studies at PNWL).

   b. Grants and Contracts

      "Thermal Plume Dispersion," Oregon State University, 16130 DGM.

3. Completed Projects

   a "Prediction and Control of Thermal Pollution," MIT, 16130 DJU.

   b. "Mathematical Models for the Prediction of Temperature Distribution Resulting from the Discharge of Heated Water Into Large Bodies of Water," Tetra Tech, Inc., Contract No. 14-12-570.

4. New Projects

   "Mixing and Dispersion at a Warm Water Outlet," St. Anthony Falls Hydraulic Laboratory(University of Minnesota), 16130 FSU.

5. Reports and Papers

   a. "Mathematical Models for the Prediction of Temperature Distribution Resulting from the Discharge of Heated Water into

Large Bodies of Water," by R.C.Y. Koh and Loh Nien Fan, entered into Project Reports System, 16130 DWO/70.

b. "Heated Surface Jet Discharged into a Flowing Ambient Stream," by Louis H. Motz and Barry A. Benedict, Report #4, Department of Environmental and Water Resources Engineering, Vanderbilt University, August 1970.

Work Plan ZFD: Heat Transport and Behavior in Large Hydrologic Systems

1. Reportable Progress

In cooperation with the Systems Analysis and Economics Branch, a computer program was developed to generate synthetic meteorological data to describe the stochastic variation in energy-budget parameters. Using the "Rank Sum Test" and the "Kolmogorov-Smirnov Test," the synthetic data were compared with historical data to determine the "goodness of fit" for several time intervals (2, 3, 4, 6, and 8 hours). The larger time intervals (6 and 8 hours)showed "good" fit between the generated and historical data for all meteorological variables except cloud cover, which due to its bimodel distribution was difficult to synthesize. Wet bulb temperature data failed the "goodness of fit" tests at the 3- and 4-hour intervals, but the other variables showed "good" fit. The majority of the variables failed the tests at the 2-hour interval. The results of the work indicate that synthetic meteorological data (except cloud cover) can be generated for time intervals as small as 6 hours (3 hours if wet bulb temperature can be considered a "minor" variable) and still retain historical stochastic variability.

The computer program which was developed can:

a. Synthesize meteorological data

b. Analyze the data for "goodness of fit" with historical data

c. Plot the synthetic data

This program is available at the Office of the Systems Analysis and Economics Branch, Water Quality Office, Environmental Protection Agency, Headquarters.

2. Continuing Projects

a. Intramural

(1) Stochastic model development (cooperative study with the Systems Analysis and Economics Branch).

(2) Refinement of techniques for predicting stream evaporation (inactive -- will be resumed).

b. Grants and Contracts

"Heat and Water Vapor Exchange Between the Water Surface and Atmosphere," Cornell University, 16130 DIP (funding for second year awarded).

3. Completed Projects -- None.

4. New Projects -- None.

Work Plan ZFF: Engineering and Cost Aspects of Heat Dissipation

1. Reportable Progress

A study on the effect of operating temperature on cooling pond area and water loss was completed. Using data collected during the 1969 field study, it was shown that increasing the pond temperature resulted in smaller pond areas and less total evaporation when equal waste heat loads are dissipated. These results confirmed computations done earlier using analytical techniques.

2. Continuing Projects

   a. "Turbulent Bed Cooling Towers," Purdue University, 16130 EMQ.

   b. "Economic Analysis of Thermal Pollution Abatement Costs in the Electric Power Industry," The Center for the Environment and Man, Inc., Contract 14-12-837.

3. Projects Completed

   a. See ZFJ

   b. "Survey and Economic Aspects of Alternate Cooling Methods for Cooling Condenser Discharge Water in Thermal Power Plants," Dynatech R/D Corporation, Contract No. 14-12-477.

   c. "An Engineering-Economic Study of Cooling Pond Performance," Littleton Research and Engineering Corporation, Contract No. 14-12-521 (See 7/9/70 Progress Report for description).

4. Studies Initiated

   In-house study on selecting appropriate materials for treating a cooling pond so that it becomes relative to solar radiation.

5. Papers and Reports

   a. "Cooling Pond Temperature Versus Size and Water Loss," Tichenor and Christianson, accepted for presentation at ASCE's National Water Resources Engineering Meeting, Phoenix, Arizona, January 11-15, 1971. (Also submitted for publication in the ASCE Power Division Journal.)

   b. "An Engineering-Economic Study of Cooling Pond Performance," Littleton Research and Engineering Corporation, was entered into the Projects Reports System as Report No. 16130DFX05/70.

c. "A Method for Predicting the Performance of Natural Draft Cooling Towers," Wintarski, Tichenor, and Byram, was entered into the Project Reports System as Report No. 16130GKF12/70.

d. "Reflective Cooling Ponds," by Wintarski and Byram, presented at ASME Winter Annual Meeting in New York, Paper #70-WA/PWR-4.

Work Plan ZF1: Advanced Power Generation

1. Reportable Progress

Technical and economic feasibility of advanced-design open-cycle gas turbine as the basis for future fossil-fueled baseload electric utility power generating stations was assessed. Tentative results indicate that gas turbine systems could be competitive with steam electric generation in 1970 and 1980 decades.

2. Continuing Projects

"Technical and Economic Feasibility of Elementary River and Lake Water Thermal Pollution with Advanced-Design Open-Cycle Gas Turbines," United Aircraft Corporation, draft of final report is being reviewed.

3. Completed Projects

a. In-house - Thermoelectricity from Waste Heat

b. Contract - None

4. New Projects - None

5. Papers and Reports

a. "Thermoelectric Generators Powered by Waste Heat From Steam-Electric Systems," by M. A. Shirazi, entered in Project Reports System, 16130-07/70

b. "Utility Applications for Advanced Gas Turbines to Eliminate Thermal Pollution," by F. R. Biancardi and G. T. Peters, ASME Paper 70-WA/GT-9.

NATIONAL COASTAL POLLUTION RESEARCH PROGRAM

PPB 1607

Status of Projects and Significant Accomplishments

Estuarine and Ocean Outfalls

A. Plumes. Final corrections were made to the ocean outfall plume model for incorporation into NWRO Working Paper #80, "User's Guide and Documentation for Outfall Plume Model."

B. Floatables. Work was initiated through a grant with the University of California at Berkeley on the significance of floatables from ocean outfalls. Initial progress was directed to development of methods of sampling.

C. Columbia River Estuary Temperature Model. The final draft of Part II, "Input-Output and Preliminary Verification," of the Columbia River model report was completed and sent for typing.

D. State-of-the-art Report. Preparation of the final typescript of the report and the figures continued at TRACOR. A revised "Foreword" authored by NCPRP staff members was transmitted for inclusion in the report. January 15th has been established as the final cutoff date for review comments. A paper authored by staff members summarized some of the results and was presented at the FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing held December 9-18, 1970, in Rome, Italy.

Barge Disposal Systems

State-of-the-art Report. The report was completed and is being typed in final draft.

Puget Sound

As part of our research efforts on ocean outfalls and barge dumping, staff members met with staff of the University of Washington Department of Oceanography and Metro to discuss a monitoring program for water quality effects in Puget Sound. They also met with representatives of Huxley College of Environmental Studies regarding pollution studies in Bellingham Bay and Puget Sound, and to discuss use of the new marine science center at Shannon Point. Possibilities of use of lab and dock space in their Manchester lab were discussed with the Director, Northwest Water Hygiene Laboratory. The R. V. Streeter, NCPRP's research vessel, was inspected, and discussions held with members of the Montlake Biological Laboratory regarding future use of the vessel and aspects of the Puget Sound study which might interest BCF.

NTA

Studies on the pickup of trace metals from sediments and NTA interaction as a function of time and concentration with several potentially noxious nuclides (Cd, As, Hg, Pb) while in contact with saline water and Yaquina estuary sediment were completed.

Studies of degradation rates and bacterial acclimation are continuing.

Literature Review

Approximately 100 to 200 abstracts are now in process under our grant 16070 FJV, "Coastal Pollution, Literature Search, Indexing and Abstracting," with Pollution Abstracts, Inc., La Jolla, California.

After the first of the year approximately 175 abstracts per month will be submitted to the WRSIC system, based on current daily output, until the required number, estimated at 800, are submitted.

Mercury

A workplan on mercury distribution and accumulation in coastal environments was prepared and forwarded to headquarters.

NCPRP was asked to participate in a summer student program, funded by NSF, which is being conducted by the University of Washington, on the subject of water pollution aspects of mercury. This work would be conducted in conjunction with the proposed workplan on mercury. The group of students was asked to visit the laboratory in mid-January to discuss the scope of the investigation, and to become acquainted with ongoing research and analytical capabilities.

Lake Superior Enforcement Action

Program Chief met with Director, Great Lakes Region; Assistant Commissioner for Enforcement; Director, National Water Quality Laboratory; and Director, Lake Superior Basins Office, to prepare plans for a study involving resources from each of the areas of responsibility represented.

A statement of need and work plan, ZAW, entitled, "Amount of Research Mining Taconite Waste Suspended in Lake Superior and Interstate Transport," was submitted to headquarters. Data from this study would be used to prepare court testimony and technical reports showing

the immediate degree of water quality impairment, and would aid in forecasting the long-range accumulation of turbidity in the lake.

In October, additional details were provided the Assistant Commissioner, R&D, and in November headquarters advised that negotiations between R&D and Enforcement were still underway to decide which course of action R&D should take for support of the enforcement conference on Lake Superior. Early in January, 1971, advice was received that a decision would be made following the mid-January enforcement conference at Duluth.

Consulting Services

In answer to a request from the Chief, Engineering Branch, a review and preliminary comments were provided on the subject of "policy on thermal discharges into the ocean."

Thermal plume calculations for cooling water discharged to Lake Michigan were obtained and sent to the Chairman, Lake Michigan Enforcement Conference Technical Committee, at his request.

The Assistant Commissioner for Enforcement and Standards Compliance requested the NCPRP to provide assistance to Axel, Brostrom and Son, Gothenburg, Sweden, in their efforts to design an ocean outfall system for the City of Gothenburg.

Equipment and Instrumentation

A Coulter Electronics particle counter was set up, checked out, and is now operational. It will be used in studies of particulate

transport from ocean outfalls, barges, and from the Reserve Mining Company discharge into Lake Superior, and for studies involving plankton counts.

Grants and Contracts

The following subjects of grant and contract applications were reviewed by staff members during the quarter:

1. Proposed Study of Submersion History of Waste Material Destined for Marine Disposal.
2. A Membrane Salinometer for Monitoring Estuaries, 16020 DXT.
3. High Latitude Oil Spill Persistence, 14020 GVF.

Reports and Papers

1. "Waste Management Concepts for the Coastal Zone," National Academy of Sciences, National Academy of Engineering, final report on project 16070 DUF identifies coastal pollution research needs. Two-thousand copies were distributed to universities and others interested in coastal pollution control.

2. "Analysis of Air-Bubble Plumes," Klas Cederwall and John D. Ditmars, California Institute of Technology, in support of project 16070 DGV.

3. Working Paper 76, "Summary of the Oceanography and Surface Wind Structures of the Pacific Subarctic Region in Relation to Waste Releases at Sea," R. J. Callaway.

4. Working Paper 77, "The 50-Mile Ballast-Oil Dumping Prohibited Zone off Alaska, Reconsidered in the Light of Available Data Gleaned from Significant Sources," M. H. Feldman.

5. "State-of-the-art for Simulation of Pollution Problems and Controls in Estuaries," presented at the FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing, Rome, Italy, 9-18 December 1970.

Plans for Third Quarter, FY 1971

Ocean Outfalls:

With completion of the barge dumping report and the Columbia River report, significantly increased effort will be applied to analysis of ocean outfall problems.

A paper on the application of numerical modeling to Pacific Northwest estuaries will be prepared for presentation at the "Estuaries Information Meeting" to be held at Oregon State University, March 19-20, 1971.

Ocean Dumping

The term "ocean dumping" has been coined by the Council on Environmental Quality and refers, apparently, to the subject matter we have called "barge disposal' or 'barge dumping."

In subsequent reports we will use the CEQ terminology, referring to our two main project areas as

A. selection of safe sites for dumping, and

B. designation of harmful materials

Under A, we plan next quarter to release the report on barge dumping. This will contain computer program listings and example calculations of sludge particle transport by ocean currents.

Under B, we plan to conduct studies of trace element distribution in various sludges presently dumped in the oceans. Attendance at the Gordon Conference on Chemical Oceanography at Santa Barbara will provide an opportunity to stimulate interest on the part of university and other research workers to identify troublesome organics in materials destined for ocean dumping and to provide technical results useful to regulatory programs. This is a fairly esoteric field, but the case of DDT shows that it must be carried out with a long lead time, for short-term studies could easily have concluded erroneously that DDT was not a problem.

NTA

NTA studies will be terminated, allowing us to devote additional time to the study of harmful trace materials.

NATIONAL EUTROPHICATION RESEARCH PROGRAM

PPB 1601

Status of Projects and Significant Accomplishments

Work Plan CNC. Comprehensive Investigation to Evaluate the Influence of NTA on the Environment.

A report containing the results of field and laboratory investigations to evaluate the influence of Nitrilotriacetic acid (NTA) on eutrophication was submitted to the Commissioner. Appendices to the NERP report contained separate reports by the University of North Carolina, Chapel Hill (16010 DOT), and the University of California, Davis (16010 DBU), relating to their investigations with NTA. The University of North Carolina report was concerned with the results of laboratory and in situ algal assays to determine the effects of NTA on algal growth and primary productivity in three North Carolina lake waters. The University of California report was concerned with in situ studies on three California lakes.

Data concerning NERP's NTA research activities were presented at the international meeting at the Canadian Center for Inland Waters, Burlington, Ontario, on December 8-10.

Work Plan ZCB. Assay Procedures for Determining Productivity Responses.

A draft of revised "Algal Assay Procedures: Bottle Test" was completed and sent out for review.

The PAAP evaluation of the October 26-28 high Cascade and coastal lake samples, with and without the addition of selected concentrations of nitrogen,

NATIONAL EUTROPHICATION RESEARCH PROGRAM

PPB 1601

Status of Projects and Significant Accomplishments

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The PAAP evaluation of the October 26-28 high Cascade and coastal lake samples, with and without the addition of selected concentrations of nitrogen,

phosphorus and carbon, added singly and in combination have been completed. Preliminary interpretation of the data indicates that Woahink, Lake of the Woods, Tahkenitch, Upper Klamath, and Ten Mile lakes are phosphorus-limited while Odell, Diamond and Triangle lakes appear to be nitrogen-limited. Odell, Lake of the Woods and Upper Klamath Lake waters were also stimulated by the addition of carbon.

The PAAP evaluation of rainwater collected at the Pacific Northwest Water Laboratory has been initiated.

Work is progressing on the evaluation of Microcystis aeruginosa and Anabaena flos-aquae as test organisms for the PAAP.

A common water sample (Triangle Lake) was provided to seven other laboratories for use in an interlaboratory precision test of the Provisional Algal Assay Procedure (PAAP).

Work Plan CND. Lake Restoration Techniques.

A second meeting was held in Madison, Wisconsin, to select candidate sites for lake restoration research. All lakes brought to the attention of the panel were considered and evaluated.

Sediment-Water Interchange

a. Characterization of Shagawa Lake sediments continued.

b. Conducted extended literature search for report on state-of-the-art in sediment-water interchange.

c. Conducted extended literature search on biological control of eutrophication.

d. Prepared proposed program for reorganized Nutrient Control Section.

Nutrient Control

a. Mr. John Tilstra met with Long Lake (Washington) Improvement Association at the Northwest Regional Office to discuss weed harvesting and the feasibility of the Association's applying to EPA for research support.

b. A paper entitled "Evaluation Study on Removal of Phosphorus and Nitrogen from Sewage Effluents by Induced Soil Percolation" has been prepared and is in the process of being cleared for publication.

c. A report on Waldo Lake groundwater infiltration is in preparation.

Other Activities

Mr. Maloney chaired a meeting of participants in the evaluation of the Provisional Algal Assay Procedure held at the University of Wisconsin, Madison, October 8-9. Participants included William E. Miller of NERP and representatives from the University of Wisconsin; University of North Carolina, Chapel Hill; University of California, Berkeley; University of California, Davis; Utah State University; Procter and Gamble Company; Lever Brothers Company; Food Machinery Corporation; and Monsanto Company.

Publications and Presentations

Miller, W. E. and T. E. Maloney. "Effects of Secondary and Tertiary Sewage Effluents on Algal Growth in Waters of a Lake-River System." Presented before the 43rd Annual Conference - Water Pollution Control Federation, October 4-9, Boston, Massachusetts.

The following papers were presented before the Lake Restoration Symposium, American Association for the Advancement of Science Meeting, December 26-31, Chicago, Illinois:

Maloney, Thomas E. "Development and Application of a Standard Algal Assay Procedure."

Power, Charles F. "Nutrient Control by Advanced Waste Treatment: The Shagawa Lake Experiment."

Bartsch, A. F. "Overview of Lake Restoration and Role of the Federal Government."

The following publications resulting from grant-supported research were published:

University of California, Berkeley, "Provisional Algal Assay Procedures - First Annual Report."

University of Florida, Gainesville, "Modeling of the Eutrophication Process." Proceedings of a workshop held at St. Petersburg, Florida, November 19-21, 1969, sponsored jointly by the Department of Environmental Engineering, University of Florida and FWQA.

Grant and Contract Research

Technical reviews of proposals for research and demonstration grants and contracts were provided for the following subjects:

1. "Effects of Non-Phosphorus Detergent Builders on Algae and Bacteria."

2. "Allocation of Eutrophication Resources in Receiving Waters."
3. "Restoration of Lake Lansing, Meridian Township, Ingham County, Michigan."
4. "Eutrophication Investigation of Long Pond, Lakeville, Connecticut."
5. "Reversal of Eutrophication through Artificial Aeration of Lakes."
6. "Factors Regulating Periphyton Growth and Production in the Hillsborough River, Florida."
7. "Management Problems in Utilization of Protozoans for Upgrading Waste Assimilation Capacity in Fresh-Water Systems."
8. "Estimation of Freshwater Ecosystem Parameters."
9. "Organic Nutrient Factors Effecting Algal Growths: Phase III."
10. "Nutrient Dynamics in an Artificially Enriched Lake."
11. "A Study to Determine the Feasibility of Using Algal Viruses to Control Algal Growth."
12. "Plankton Monitor."
13. "Silt Removal from a Lake Bottom."
14. "Holiday Lake Phosphate Reduction through Draw Down and Siphon Installation."
15. "A Planning Grant to Develop a Lake Eutrophication Research Program Plan."

Plans for Third Quarter, FY 1971

Work Plan CNC. Comprehensive Investigation to Evaluate the Influence of NTA on the Environment.

Research is terminated.

Work Plan ZCB. Assay Procedures for Determining Productivity Responses.

Continue assays on the effects of various nutrient additions to Oregon lakes; continue assays on rainwater; develop culture medium for growing diatoms; continue participation in interlaboratory precision tests for evaluation of PAAP; and complete revision of PAAP.

Work Plan CND. Lake Restoration Techniques.

Determine future research for Shagawa Lake Project; complete manuscript on Crabtree Creek study; begin "state-of-art" paper on full-scale lake restoration; begin paper on Waldo Lake.

Sediment-Water Interchange. Work on the following reports: Biodegradibility of NTA; solubilization of metals by NTA; alum treatment experiment at Cline's Pond; state-of-the-art in sediment-water interchange; Upper Klamath Lake studies; and sediment-water interchange aquarium experiments. Continue literature search on state-of-the-art in sediment-water interchange, and on biological control; and continue characterization of Shagawa Lake sediments.

Nutrient Control. Complete Waldo Lake groundwater manuscript; initiate the field collection program for the Rainfall Assay and Productivity Study; and develop pilot research plans for 1971.

CONSOLIDATED LABORATORY SERVICES PROGRAM

Status of Projects and Significant Accomplishments

General

The NTA studies were completed. The temporary employees hired for the NTA effort were terminated by December 1, 1970. Analytical Quality Control charts produced by the computer program provided the confidence in the NTA data produced by the regular staff plus the eight temporary employees.

The CO_2 field gas chromatograph was shipped to the Southeast Water Laboratory. The second unit is now being assembled for use at PNWL.

Data for the mining waste study has been transmitted to the Operations section in the Regional Office.

A reflux digestion system such as that used by the AOAC has been used to digest samples containing organic material for the analysis of mercury. Methyl mercuric chloride was decomposed in this reflux digestion system. A sample of coal submitted by the Regional Technical Programs group was analyzed for mercury using the reflux digestion system. The coal was completely solubilized by a wet acid oxidative digestion.

Automated Analytical Systems

As a result of use of an automated system to analyze for six constituents, the laboratory area has been rearranged to permit better use of laboratory bench space. The units to analyze four constitutents have been placed on shelves; thus, the bench space has been made available which previously held these four units. Some changes have been made in the computer handling of data to reduce bookkeeping chores.

Specialized Analysis

Recovery studies were started on organic arsenic materials. Necessary changes were made to increase the sensitivity of the arsenic determination so that the laboratory can detect 2 µg/l and will report levels of 5 µg/l.

Fluorometric analysis of samples collected by the Washington State Department of Ecology and requested by the Regional Technical Programs operation revealed that one sample had a significant PBI level but did not contain the fluorescent material found in the spent sulfite liquor. The fluorescent technique for tracing spent sulfite liquor is very sensitive and specific.

Atomic Absorption Spectrophotometry

During this quarter the samples were aspirated directly into the atomic absorption spectrophotometer because problems arose in concentrating samples by evaporation. The source of the problem was in the hood used to remove water vapor and acid fumes. The facilities section corrected the problem at the end of the quarter. A lower detection limit can again be achieved with concentration of samples.

Analysis of Carbon

After repairs were completed on the carbonaceous analyzer, it was modified to the Model 915 Beckman Carbonaceous Analyzer. Analysis for total carbon and inorganic carbon is being resumed.

The total carbon system marketed by Oceanography International has been received and evaluated. The laboratory will prepare a requisition to purchase the instrument.

It is now possible to analyze for total carbon, inorganic carbon, particulate carbon, total dissolved carbon, soluble inorganic carbon, total organic carbon, soluble organic carbon in water samples. If samples can be dried and pulverized, carbon, hydrogen, and nitrogen analyses can be performed with the use of the CHN analyzer.

Biology

Identification and enumeration of organisms from artificial substrate baskets and benthic samples were completed for the Clark Fork River Study in support of the TA&I Branch. The analysis of phytoplankton samples collected earlier in the year from Waldo Lake by the Eutrophication Program is practically complete

Microbiology

Samples from Pollution Surveillance, NTA studies, and from the National Waste Treatment and Control Program were handled. Some specialized approaches were used in the NTA studies.

Areas of Concern

Balancing of workload between periods of high activity such as during the NTA studies and during lulls such as the month of December.

Reports and Papers

Oral presentation was made on the topic "Analytical Quality Control-Chemical Analysis" before the Water Supply and Water Pollution Control Committee of the Pacific Northwest River Basins Commission on December 8, 1970.

Equipment

Requisitions were prepared for the purchase of a Dual Channel Technicon II and for the Atomic Absorption spectrophotometers.

Plans for Third Quarter, FY 1971

A complete evaluation of the Oceanography International total carbon system will be made.

Changes will be made in the SHAVES system so that bookkeeping for the backlog will be done by computer. The computer will also produce chemical analytical bench sheets for use in the laboratory from the laboratory analysis required forms.

TRAINING AND MANPOWER DEVELOPMENT

Status of Projects and Significant Accomplishments

Direct Training

The following courses were presented during the quarter:

"Sewage Treatment Facilities for Federal Installations,"

October 26-30 -- 27 students

November 2-6 -- 25 students

"Analysis and Control of Thermal Pollution,"

December 7-11 -- 31 students

Staff members provided 30 hours of lecture and demonstration for the sewage treatment plant operator course at Linn-Benton Community College.

A one-day Instructor Symposium was conducted for Training staff as well as other Laboratory personnel. Four eight-hour Red Cross First Aid Training courses and an eight-hour safe driving course were provided Laboratory staff.

Manpower Development

"Operation Impact" funds from the Department of Labor were approved for the City of Portland and the States of Washington and Alaska. In Portland, Oregon, this program includes Neighborhood Youth Corps workers at area sewage treatment plants.

Initial plans were made to conduct a training needs survey with emphasis on the need for operators and supporting personnel at sewage treatment plants.

Public Relations

Tours and orientation were provided for 85 people; staff provided speaking services before groups totaling 60 people. Films and slides/tapes were loaned for viewings by over 1000 people.

Plans for the Third Quarter, FY 1971

A staff member will participate as an instructor in a sewage treatment plant operator short course arranged by the Idaho State Department of Health. A technical workshop on use of the membrane filter for microbiological determinations will be presented by a staff member at four locations in Oregon and Washington.

"Data Evaluation and Analysis" training course will be presented March 15-19, 1971.